Unit 3: Standard Data Structures

Content Area: **Computer Science**
Course(s):
Time Period: **Marking Period 1**
Length: **3-4 Weeks**
Status: **Published**

Summary

Students will represent information within a program by using data structures. They will choose appropriate data structures based upon the need within the program, taking care to note storage use. They will use classes on/or objects to assist in the writing of programs/code.

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MA.9-12.1.2.12prof.Cr	Creating
MA.9-12.1.2.12prof.Cr2	Organizing and developing ideas.
MA.F-LE.A.2	Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table).
LA.K-12.NJSLSA.L4	Determine or clarify the meaning of unknown and multiple-meaning words and phrases by using context clues, analyzing meaningful word parts, and consulting general and specialized reference materials, as appropriate.
LA.K-12.NJSLSA.L5	Demonstrate understanding of word relationships and nuances in word meanings.
CS.9-12.8.1.12.AP.6	Create artifacts by using procedures within a program, combinations of data and procedures, or independent but interrelated programs.
CS.9-12.8.1.12.DA.2	Describe the trade-offs in how and where data is organized and stored.
CS.9-12.8.1.12.DA.4	Explain the relationship between binary numbers and the storage and use of data in a computing device.
TECH.8.2.12.E.1	Demonstrate an understanding of the problem-solving capacity of computers in our world.
TECH.8.2.12.E.3	Use a programming language to solve problems or accomplish a task (e.g., robotic functions, website designs, applications, and games).
TECH.8.2.12.E.4	Use appropriate terms in conversation (e.g., troubleshooting, peripherals, diagnostic software, GUI, abstraction, variables, data types and conditional statements).
	Programmers choose data structures to manage program complexity based on functionality, storage, and performance trade-offs.

Essential Questions / Enduring Understandings

Essential Questions:

- When do you use each of the data structures to represent information in a program?
- How do you manipulate the date structures to hold data?

- What are simple data types?
- When would you use a given simple data type?
- What is an abstract data type?
- What is a data structure?
- How do you choose a datas structure?
- What are the operations that can be used on data structures?
- Given an operation on data structures, explain how can a given operation on data structures be implenented into a program?
- How are one-dimensinal arrays used in programs?
- How is a class utilized in a program?

Enduring Understandings:

- Problems need to be solved in order to meet the needs of the user
- Abstract data types and operations can be used to solve problems
- Classess can be used to simplify coding
- One-dimensional arrays can be used to store data
- Different data types are used for different tasks

Objectives

Student will know:

- when to use each of the simple data types
- the purpose behind classes
- how to implent a one-dimensional array
- how to include build-in or library functions and structures
- how to design a user interface
- how to choose test data
- how to debug a program

Students will be skilled at:

- recognizing data structures, their storage capabilities and when to use each type.

Learning Plan

- Preview the essential questins and connect to learning throughout the unit.
- Discuss the use of primitive data types and when best to use them.
- Write programs that implement primitive data tyes to a given set of specifications.
- Discuss abstract data types and proved examples of when to use them.
- Using a series of problems, discuss with the students the different operations that will be required in order to solve the problem.
- Discussion of classes
- Discussion of accessor methods for classes
- Discussion of interactions of classes
- Identify and implement class structures
- Use of strings in programs
- Discussion of how arrays are created
- Use of one-dimensional arrays
- Discuss the different opertions that can be used on data structures
- Implement a given operation on a data structure by writing a program that meets certain specifications
- Have students work with a variety of dats structures in developeing programs that meet certain specifications
- Have students write programs to a given set of specifiations and then implement a variety of tests upon the program.

Assessment

- Assessments

  - Formative: Daily assessments using examples from class notes and CodeHS.com, AP Classroom/Albert Checks for Understanding

  - Summative: Teacher-created assessments/projects and CodeHS Computer Science Projects, AP Classroom/Albert Unit Assessments

  - Benchmark: Check for understanding benchmark assessments on CodeHS, AP Classroom/Albert/Khan Academy Diagnostics

  - Alternative Assessments: Student-centered activities such as a doorbell coding project, game design projects, and other activities involving real world applications

- Complete performance tasks: Student will be able to design/write/read programs using appropriate code
- Complete Quizzes/Test: Data Types, Classes , Structure of Program
- Teacher observation of students doing work on the performnace tasks
- Conduct self-assessments and reflections
- Conduct peer evaluations
- Participate in class discussions
- Sample AP multiple choice questions

Materials

- Core instructional materials: Core Book List

  Supplemental materials: CodeHS

- Computer
- Reference books

Integrated Accommodations and Modifications

See Linked Document.